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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/729,426	12/05/2003	Samson Mil'shtein	0813.2003-001	8407

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EXAMINER

HU, SHOUXIANG

ART UNIT	PAPER NUMBER
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2811

DATE MAILED: 03/11/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

H.A

Office Action Summary

Application No.

10/729,426

Applicant(s)

MIL'SHTEIN ET AL.

Examiner

Shouxiang Hu

Art Unit

2811

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☐ Responsive to communication(s) filed on ____.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-13 is/are pending in the application.
- 4a) Of the above claim(s) ____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) ____ is/are allowed.
- 6) ☒ Claim(s) 1-13 is/are rejected.
- 7) ☐ Claim(s) ____ is/are objected to.
- 8) ☐ Claim(s) ____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☒ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 05 December 2003 is/are: a) ☐ accepted or b) ☒ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. ____.
 3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|--|--|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413)
Paper No(s)/Mail Date. ____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152) |
| 3) <input checked="" type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
Paper No(s)/Mail Date <u>6/16/2004</u> | 6) <input type="checkbox"/> Other: ____ |

DETAILED ACTION

Drawings

1. The drawings are objected to under 37 CFR 1.83(a). The drawings must show every feature of the invention specified in the claims. Therefore, the recited subject matters that: "the gate voltages being individually biased to tailor the potential field" and "the tailoring occurs" to create a uniform distribution of the energy subbands" must be shown or the feature(s) canceled from the claim(s), as the drawings fail to clearly show how the individual gates are biased. No new matter should be entered.

A proposed drawing correction or corrected drawings are required in reply to the Office action to avoid abandonment of the application. The objection to the drawings will not be held in abeyance.

Claim Objections

2. Claims 1-13 are objected to because of the following informalities and/or defects:

Claim 1 recites the term of "the potential field", but it lacks sufficient antecedent basis for such a term; and it fails to clarify where such field is observed. It is further noted that the term of "potential" and the term of "field" are two related but substantially different variables in physics.

Claims 4, 6 and 7 recite the term of "along the channel," but a channel normally has to two dimensions, and it is not clear which of them is referred to here.

The terms of "the heterostructure barrier" recited in claim 6, and "the 2D electron gas barrier" recited in claim 7 lack sufficient antecedent basis in the claims.

Appropriate correction is required.

Claim Rejections - 35 USC § 112

3. The following is a quotation of the first paragraph of 35 U.S.C. 112:

The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same and shall set forth the best mode contemplated by the inventor of carrying out his invention.

4. Claims 1-13 are rejected under 35 U.S.C. 112, first paragraph, as failing to comply with the written description requirement. The claim(s) contains subject matter which was not described in the specification in such a way as to reasonably convey to one skilled in the relevant art that the inventor(s), at the time the application was filed, had possession of the claimed invention. These claims recite the subject matters of "the gate voltages being individually biased to tailor the potential field" and/or "substantially uniform potential" and/or "the tailoring occurs" to "create a uniform distribution of the energy subbands" and/or "width" of the heterostructure barrier is substantially uniform". However, the disclosure lacks an adequate description regarding how the multi-gates are individually biased (such as the relationships between the individual gate potentials), so as to achieve the above recited potential and/or subband uniformities; and/or, on how such individually biased potential relationships can be maintained when the overall bias condition changes for the gate and/or when the drain potential changes.

In addition, it is not clear how a potential can be kept uniform in the transistor or in the channel, as the source and drain are normally at different potentials during on-state, while the channel is located between the source and drain, which makes the potential in the channel naturally non-uniform.

Furthermore, each individual gate always generates non-uniform fringe field at the bottom edges or corners; and it is not clear how the recited uniform distribution of energy subbands and the uniform potential recited in claims 4 and 5 can be built with the existence of the such fringe field.

Moreover, it is not clear how an electron can be accelerated by the uniform potential as recited in claim 5, since the electric field strength would be zero in such a uniform potential.

Claim Rejections - 35 USC § 102

5. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

6. Claims 1-10 and 13, insofar as being in compliance with 35 U.S.C 112 and as being best understood in view of the claim objections above, are rejected under 35 U.S.C. 102(b) as being anticipated by Boos et al. ("Boos"; Reduction of Gate Current in AlSb/InAs HEMTs Using A Dual Gate Design, Electronics Letters, Vol. 32, NO. 17, August 15, 1996; of record).

Boos discloses a heterostructured field effect transistor (Figs. 1-3; HEMT), comprising: two gates (G1 and G2; 0.5 μm apart), wherein the gate voltages are individually biased to tailor the potential and/or field in the channel of the transistor.

Regarding claims 2-8, it is noted that at least some of the bias conditions for the individual gates can naturally produce a substantially improved uniformities in potential, in distribution of energy subbands, in width of the heterostructure barrier, and/or in the slope of the 2D electron gas barrier, compared with the case of a single-gate configuration.

Regarding claim 13, the transconductance of the transistor of Boos can be naturally substantially linear over a range of the gate voltages, compared with the case of a single-gate configuration.

Claim Rejections - 35 USC § 103

7. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

8. Claims 11 and 12, insofar as being in compliance with 35 U.S.C. 112 and as being best understood in view of the claim objections above, are rejected under 35 U.S.C. 103(a) as being unpatentable over Boos in view of Jan et al. ("Jean"; FR25550889; of record).

The disclosure of Boos is discussed as applied to claims 1-10 and 13 above.

Although Boos does not expressly disclose that the transistor can have three or four gates, one of ordinary skill in the art would readily recognize that more gates can be desirably formed in a field effect transistor for improving the performance of the channel, as evidenced in Jean (see the individually biased multi-gates 9 in Fig. 1).

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to make the transistor of Boos with three or four gates being formed therein, per the teachings of Jean, so that a transistor with improved channel performance would be obtained.

Conclusion

9. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure. References A-C are cited as being related to a multi-gate structure.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Shouxiang Hu whose telephone number is 571-272-1654. The examiner can normally be reached on Monday through Thursday, 7:30 AM to 6:00 PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Eddie C. Lee can be reached on 571-272-1732. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

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Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

SH
March 04, 2005

A handwritten signature in black ink, appearing to read 'Shouxiang Hu', written in a cursive style.

SHOUXIANG HU
PRIMARY EXAMINER